UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/787,322	FAULKNER, ET AL
	Examiner	Art Unit
	Tanim Hossain	2445

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _04 June 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-29_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-29_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

U.S. Patent and Trademark Office

PTOL-326 (Rev. 08-06)   Office Action Summary   Part of Paper No./Mail Date 20081220

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Chandrasekaran (U.S. 6,948,044) in view of Official Notice.

As per claim 1, Chandrasekaran teaches a system for dynamically configuring a virtual

volume associated with a host system, comprising: a set of storage devices, each of which

includes physical block addresses for storing data associated with the virtual volume (column 3,

lines 8-66); and a network switch system connecting the host system and the set of storage

devices, and including: a set of storage processors each maintaining virtual volume objects

comprising at least one of (i) first tier objects reflecting a relationship between the physical block

addresses and one or more logical partitions of virtual volume data, and (ii) second tier objects

reflecting a logical configuration of the virtual volume (column 4, lines 1-56; column 1, line 52 –

column 2, line 6; column 3, lines 26-27). Chandrasekaran uses the virtual volume objects to

manage the virtual volume (column 4, lines 1-56; column 5, line 29 – column 6, line 16; column

6, line 36-39; column 6, line 62 – column 7, line 9), but does per se teach that they are used to

update the volume during runtime. In view of the Chandrasekaran system's managing of the

virtual volume, Official Notice is taken that it would have been obvious to one of ordinary skill in the art at the time of the invention to include the ability to update the system during runtime, as updating volumes is a well known component of volume management. Given that Chandrasekaran teaches other management aspects of the volume, it would have been obvious to include updating dynamically during runtime specifically.

As per claim 2, Chandrasekaran teaches the system of claim 1, wherein the network switch system dynamically updates the virtual volume based on a host system request (column 5, lines 3-66).

As per claim 3, Chandrasekaran teaches the system of claim 1, wherein the network switch system dynamically updates the virtual volume by at least one of adding a virtual volume object to a storage processor, removing a virtual volume object from a storage processor, and moving a virtual volume object from one storage processor to another storage processor (Figure 9; column 1, lines 35-67; column 5, lines 3-66).

As per claim 4, Chandrasekaran teaches the system of claim 1, wherein storage processors having a first tier object are connected to a storage device storing virtual volume data and storage processors having a second tier object are connected to the host system (Figure 9; column 1, lines 35-67; column 5, lines 3-66).

As per claim 5, Chandrasekaran teaches the system of claim 1, wherein the network switch system includes a Virtualization Block Manager (VBM) component that, based on a host system request, restructures a logical tree reflecting relationships between the second tier and first tier objects of the virtual volume (Figure 9; column 1, lines 35-67; column 5, lines 3-66).

As per claim 6, Chandrasekaran teaches the system of claim 5, wherein the network switch system further includes a Virtualization Coherency Manager (VCM) that assigns the first tier objects to selective ones of the storage processors and the second tier objects to selective ones of the second tier storage processors based on the restructured logical tree (column 3, lines 3-66; column 4, lines 1-56).

As per claim 7, Chandrasekaran teaches the system of claim 5, wherein when the host system request requires the VBM component to add a new second tier object to a target storage processor maintaining a first tier object, the VBM component configures the new second tier object to include a Local Reference Node (LRN) that references the first tier object (Figure 9; column 1, lines 35-67; column 5, lines 3-66).

As per claim 8, Chandrasekaran teaches the system of claim 7, wherein the VBM component configures the second tier object to include a Remote Reference Node (RRN) that references another first tier object maintained by a storage processor different from the target storage processor (column 3, lines 3-66; column 4, lines 1-56).

As per claim 9, Chandrasekaran teaches the system of claim 5, wherein when the host system request requires the VBM component to add a new first tier object to a target storage processor maintaining a second tier object, the VBM component configures the second tier object to include a Local Reference Node (LRN) that references the new first tier object (Figure 9; column 1, lines 35-67; column 5, lines 3-66).

As per claim 10, Chandrasekaran teaches the system of claim 5, wherein when the host system request requires the VBM component to add to a target storage processor a new first tier object that is logically related to a second tier object maintained in a different storage processor,

the VBM component configures the second tier object to include a Remote Reference Node

(RRN) that references the new first tier object (Figure 9; column 1, lines 35-67; column 5, lines

3-66).

As per claim 11, Chandrasekaran teaches the system of claim 6, wherein when the host

system request requires the VBM component to remove an existing second tier object tree from a

target storage processor, the VCM deletes all second tier objects in the second tier tree before

deleting any first tier objects that are solely referenced by the removed second tier object tree

(column 3, lines 3-66; column 4, lines 1-56).

As per claim 12, Chandrasekaran teaches the system of claim 11, wherein the target

storage processor maintains an existing first tier object referenced by the existing second tier

object tree and by a remote second tier object maintained by a remote storage processor, and

wherein the VCM maintains the existing first tier object when deleting the existing second tier

object (Figure 9; column 1, lines 35-67; column 5, lines 3-66; column 3, lines 3-66; column 4,

lines 1-56).

As per claim 13, Chandrasekaran teaches the system of claim 6, wherein when the host

system request requires the VBM component to remove an existing first tier object from a target

storage processor, the VCM deletes all references to the existing first tier object from any second

tier objects (Figure 9; column 1, lines 35-67; column 5, lines 3-66).

As per claim 14, Chandrasekaran teaches the system of claim 6, wherein when the host

system request requires the VBM component to move an existing first tier object from a first

storage processor to a second storage processor having a remote reference to the existing first tier

object, the VCM sends a new second tier object tree to the first and second storage processors

that removes any references to the existing first tier object (Figure 9; column 1, lines 35-67; column 5, lines 3-66).

As per claim 15, Chandrasekaran teaches the system of claim 14, wherein the VCM sends a new first tier object to the second storage processor that deletes the remote reference to the existing first tier object from the second storage processor (Figure 9; column 1, lines 35-67; column 5, lines 3-66).

As per claim 16, Chandrasekaran teaches the system of claim 15, wherein the VCM sends a copy of the existing first tier object to the second processor following deletion of the remote reference (Figure 9; column 1, lines 35-67; column 5, lines 3-66).

As per claim 17, Chandrasekaran teaches the system of claim 16, wherein the VCM sends a new second tier object tree to the second storage processor having a new local reference to the copy of the existing first tier object (column 3, lines 3-66; column 4, lines 1-56).

As per claim 18, Chandrasekaran teaches the system of claim 17, wherein the VCM sends the new second tier object tree to a third storage processor with a remote reference to the copy of the existing first tier object sent to the second storage processor (Figure 9; column 1, lines 35-67; column 5, lines 3-66).

As per claim 19, Chandrasekaran teaches the system of claim 2, wherein the network switch system dynamically updates the virtual volume by collecting state information from the storage processors reflecting a current view of the virtual volume and reconfiguring a logical tree reflecting a logical relationship between the virtual volume objects based on the state information and the host system request (column 3, lines 3-66; column 4, lines 1-56).

As per claim 20, Chandrasekaran teaches the system of claim 19, wherein the current

view of the virtual volume includes information reflecting which storage processors maintain

first tier objects and which storage processors maintain second tier objects (Figure 9; column 1,

lines 35-67; column 5, lines 3-66).

As per claim 21, Chandrasekaran teaches the system of claim 1, wherein each storage

processor includes a virtualization state manager (VSM) that is configured to manage a local

version of the virtual volume (Figure 9; column 1, lines 35-67; column 5, lines 3-66).

As per claim 22, Chandrasekaran teaches the system of claim 22, wherein each storage

processor VSM is configured to manage any of the virtual volume objects maintained by the

respective storage processor (column 3, lines 3-66; column 4, lines 1-56).

As per claim 23, Chandrasekaran teaches the system of claim 6, wherein a single storage

processor includes a Master VSM (MVSM) that is in an active state (column 3, lines 3-66;

column 4, lines 1-56).

As per claim 24, Chandrasekaran teaches the system of claim 23, wherein the MVSM is

configured to determine which virtual volume objects are affected by the restructured logical tree

(column 3, lines 3-66; column 4, lines 1-56).

As per claim 25, Chandrasekaran teaches the system of claim 24, wherein the VCM

assigns the first and second tie objects to respective first and second tier storage processors based

on the affected virtual volume objects determined by the MVSM (column 3, lines 3-66; column

4, lines 1-56).

As per claim 26, Chandrasekaran teaches the system of claim 23, wherein the network

switch system designates the single storage processor as a Master Virtualization Storage

Processor (MVSP) by activating the MVSM in the designated MVSP (column 3, lines 3-66;

column 4, lines 1-56).

As per claim 27, Chandrasekaran teaches the system of claim 26, wherein non-MVSP

storage processors include an MVSM that in an inactive state when the single storage processor

is designated as the MVSP (column 3, lines 3-66; column 4, lines 1-56).

As per claim 28, Chandrasekaran teaches the system of claim 2, wherein the network

switch system includes a Virtualization Coherency Manager (VCM) that updates virtual volume

assignments to the storage processors based on the host system request (column 3, lines 3-66;

column 4, lines 1-56).

As per claim 29, Chandrasekaran teaches the system of claim 28, wherein the network

switch system includes a Virtualization Block Manager (VBM) that creates the first and second

tier objects based on a user request to update the virtual volume (column 3, lines 3-66; column 4,

lines 1-56).

Response to Arguments

Applicant's arguments filed on June 4, 2008 have fully been considered, but are not

persuasive.

a. Applicant asserts that Chandrasekaran does not teach "first tier objects reflecting a

relationship between the physical block addresses and one or more logical partitions of virtual

volume data, and second tier objects reflecting a logical configuration of the virtual volume."

Examiner respectfully disagrees. First, such objects are inherent by the nature of the invention.

Because Chandrasekaran teaches virtual address spaces corresponding to physical block

addresses, where the physical storage spaces may be located throughout the network (column 3,

lines 26-27; column 4, lines 11-14), there must exist some mechanism through which the system

can keep track of which physical storages correspond to which virtual storage spaces. Without

such a mechanism, data storage and retrieval would become impossible. As such, any index,

table, process, or application that keeps track of the physical-to-virtual mappings constitutes a

first tier object reflecting a relationship between block addresses and logical partitions, as

claimed. Nevertheless, Chandrasekaran explicitly teaches such indexing and mapping in column

4, lines 11-14; column 5, lines 11-14; column 9, lines 54-64; and column 10, lines 49-56. The

existence of the second tier objects is also inherent, as they reflect the configuration of the virtual

volume. Such objects keep track of where data is stored. Without this, data would become

irretrievable, given that there would be no way to decipher data location, for example.

Therefore, any object that keeps track of stored data locations may constitute the claimed second

tier object. Chandrasekaran also explicitly teaches such objects in column 3, lines 36-39; column

9, lines 54-64; and column 10, lines 49-56. As such, these limitations are fully taught in

Chandrasekaran.

b. Because the abovementioned claim limitation is taught in Chandrasekaran, the

inclusion of the well known concept of dynamic updating of the virtual volume during runtime

would arrive at the claimed invention. A motivation to include such a teaching exists in the art,

such that real-time operations are desirable. Commands to the virtual volume would execute

instantly, instead of asynchronously, which increases the efficiency of the system. Specifically,

the user commands would directly cause the system to dynamically update the virtual volume at

runtime. The inclusion of such a concept is eminently well known, so the results of such a

modification are well known and predictable. For one example of this concept, please see U.S.

Patent Publication 2006/0195676 to Honda, paragraph 0167.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time

policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing

date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Tanim Hossain whose telephone number is (571)272-3881. The

examiner can normally be reached on 8:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Glenton Burgess can be reached on 571/272-3949. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

like assistance from a USPTO Customer Service Representative or access to the automated

information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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